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PATENT APPLICATION

U.S. Patent Application

By

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For

INTELLECTUAL PROPERTY AUDIT SYSTEM

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TITLE OF THE INVENTION~~INTELLECTUAL PROPERTY AUDIT SYSTEM~~RELATED APPLICATIONS

This application is a continuation-in-part application of U.S. patent application serial number 08/161,816, filed December 6, 1993, entitled "INTELLECTUAL PROPERTY AUDIT SYSTEM," incorporated herein by reference.

BACKGROUND OF THE INVENTIONField of the Invention

The present invention generally relates to the field of intellectual property audit systems, and more particularly, to the field of intellectual property systems which collects pertinent data regarding an intellectual property portfolio and analyzes the collected data against empirical data to provide a qualitative and/or quantitative analysis of the intellectual property portfolio.

Description of the Related Art

In general, purchasers of assets which are intellectual property intensive typically purchase these assets based upon some estimated value which, of course, begins with an offer for sale. When a creditor is considering advancing funds based upon the value of fixed assets, such as equipment, an appraisal is performed and a liquidation value is determined. Then

1           a liquidity adjustment is considered and a liquidation  
2           value is concluded. The same valuation approaches can  
3           be employed to determine the liquidation value of  
4           intellectual property. It is known to value  
5           intellectual property assets with respect to various  
6           accounting procedures which conform to Generally  
7           Accepted Accounting Procedures (GAAP). There are  
8           typically three such procedures: cost, market and  
9           income approaches.

10          The cost approach gives consideration to the cost  
11          to reproduce or replace the subject intellectual  
12          property. For example, for patent intellectual  
13          property, this approach would consider the cost  
14          associated with research, engineering, design and  
15          testing activities. In trademark cases the advertising  
16          expenses that would be needed to create a trademark of  
17          similar prominence would be considered.

18          From this amount an allowance is deducted to  
19          reflect all forms of depreciation or obsolescence  
20          present, whether it arises from physical, functional or  
21          economic causes. Physical deterioration (depreciation)  
22          is the loss in value resulting from wear and tear from  
23          operations and exposure to the elements. Functional  
24          obsolescence is the loss in value within the property  
25          as a result of such things as changes in design,  
26          materials, or processes, overcapacity, inadequacy,  
27          excess construction, lack of utility, and excess  
28          operating cost. Economic obsolescence is the loss in  
29          value that results from influences external to the  
30          property such as the general state of economy, the  
31          effect of governmental regulations, and the like. A

1 summary of the cost approach is presented below.

2 Replacement cost

3 Less: Physical Depreciation

4 Less: Functional Obsolescence

5 Less: Economic Obsolescence

6 Equals: Fair Market Value

7 Physical and functional obsolescence is not  
8 usually an important factor when valuing intellectual  
9 property but care is needed to consider the economic  
10 obsolescence that can be introduced by outside forces.

11 Unfortunately the cost to develop intellectual  
12 property rarely bears any relationship to the economic  
13 earning power of the property or the value of the  
14 property.

15 The market approach gives consideration to prices  
16 paid for similar property in arm's length transactions.  
17 Adjustments can be made, if necessary, to the indicated  
18 market prices to reflect the condition and utility of  
19 the property being appraised relative to the market  
20 comparative. This approach is applicable where there  
21 is an active market with a sufficient quantity of  
22 reliable and verifiable data. Usually, similar  
23 property that exchanged between independent parties for  
24 which price data is disclosed is impossible to find for  
25 intellectual properties. The activities of the  
26 Resolution Trust Corporation are however beginning to  
27 provide some of the previously missing data. At  
28 present, the market approach is difficult to implement  
29 for intellectual property.

30 The income approach, by default, is still the most

1 preferred method. It considers the present value of  
2 the prospective economic benefits of owing the  
3 appraised property. This involves a capitalization of  
4 the forecasted income stream with consideration given  
5 to the duration of the income and the risks related to  
6 its achievement.

7 Care must be employed to assure that economic  
8 benefits derived from the intellectual property are  
9 isolated from the contribution to earnings derived from  
0 10 the complementary assets of the business. When  
0 11 properly done, the income approach can provide an  
0 12 accurate indication of the fair market value of  
0 13 intellectual property. Once the fair market value of  
0 14 the intellectual property portfolio has been  
0 15 determined, then as indicated above, the fair market  
0 16 value is adjusted according to conventional methods  
0 17 which consider effects such as amount of time required  
0 18 to dispose of the portfolio, market evidence of similar  
0 19 intellectual property portfolios sold in liquidation  
0 20 and cost to liquidate the property.

21 These accepted accounting methods rely or function  
22 on the availability of sufficient data relating to the  
23 intellectual property portfolio itself. Thus, in this  
24 situation, the seller of the intellectual property  
25 portfolio typically has used and marketed the  
26 intellectual property over a sufficiently long time  
27 period that suitable data has been collected to  
28 formulate a price based upon one of the above  
29 accounting valuation techniques. However, these  
30 accounting techniques typically do not provide reliable  
31 and/or dependable valuation results when the seller of

1           the intellectual property portfolio has not collected  
2           data or has not used or marketed the portfolio long  
3           enough to obtain such data.

4           In addition, for typical purchases of intellectual  
5           property assets, there is typically unavailable an  
6           independent indicator of the worth of the intellectual  
7           property to be sold. The independent indicator which  
8           is lacking may be either a qualitative or quantitative  
9           indicator of the worth of the intellectual property  
10          portfolio.

11          Accordingly, it is desirable to provide an  
12          independent analysis of an intellectual property  
13          portfolio including an independent qualitative or  
14          quantitative worth indicator of the intellectual  
15          property portfolio to be acquired.

16          In addition, it is also desirable to provide an  
17          intellectual property audit system that does not depend  
18          on the owner of the portfolio having previously used  
19          and marketed the portfolio.

20          It is further desirable to provide an intellectual  
21          property audit system which can be used to determine  
22          the qualitative and/or quantitative value of the  
23          intellectual property portfolio in an efficient and  
24          relatively rapid manner.

25          It is also desirable to provide the qualitative  
26          and/or quantitative value by analyzing the intellectual  
27          property itself in a mechanized manner as well as  
28          considering external factors relating to, for example,  
29          characteristics of the purchasing and selling entities.

30          Finally, it is also desirable that the  
31          intellectual property audit system be provided with the

1 ability to output requests for manual assistance to  
2 correct, for example, erroneously entered data or  
3 incomplete or insufficient data causing the  
4 intellectual property audit system to be unable to  
5 completely analyze the input data for determining of an  
6 intellectual property portfolio value. Accordingly,  
7 the audit system permits a user to manually correct or  
8 complete data to permit the audit system to determine a  
9 qualitative and/or quantitative intellectual property  
10 portfolio value.

11 SUMMARY OF THE INVENTION

12 It is, therefore, an object of the present  
13 invention to provide an independent analysis of an  
14 intellectual property portfolio including an  
15 independent qualitative or quantitative worth indicator  
16 of the intellectual property portfolio to be acquired.

17 It is also an object of the present invention to  
18 provide an intellectual property audit system that does  
19 not depend on the owner of the portfolio having  
20 previously used and marketed the portfolio.

21 It is also an object of the present invention to  
22 provide an intellectual property audit system which can  
23 be used to determine the qualitative and/or  
24 quantitative value of the intellectual property  
25 portfolio in an efficient and relatively rapid manner.

26 It is another object of the present invention to  
27 provide the qualitative and/or quantitative value by  
28 analyzing the intellectual property itself in a  
29 mechanized manner as well as considering external  
30 factors relating to, for example, characteristics of

1           the purchasing and selling entities.

2           Further, it is an object of the present invention  
3           that the intellectual property audit system be provided  
4           with the ability to output requests for manual  
5           assistance to correct, for example, erroneously entered  
6           data or incomplete or insufficient data causing the  
7           intellectual property audit system to be unable to  
8           completely analyze the input data for determining of an  
9           intellectual property portfolio value. Accordingly,  
10          the audit system permits a user to manually correct or  
11          complete data to permit the audit system to determine a  
12          qualitative and/or quantitative intellectual property  
13          portfolio value.

14          To achieve these and other objects, the present  
15          invention provides an intellectual property computer-  
16          implemented audit system for valuing an intellectual  
17          property portfolio. The intellectual property audit  
18          system includes a first database storing first  
19          information relating to the intellectual property  
20          portfolio and a database access and collection device  
21          connected to the first database and accessing the first  
22          database and retrieving the first information. In  
23          addition, the intellectual property audit system also  
24          includes a second database storing empirical data  
25          relating to known intellectual property portfolios, and  
26          a comparison device connected to the database access  
27          and collection device and to the second database, the  
28          comparison device receiving the first information from  
29          the database access and collection device and comparing  
30          the first information to the empirical data retrieved  
31          from the second database producing an intellectual

1           property worth indicator indicating the worth of the  
2           intellectual property portfolio.

3           These together with other objects and advantages  
4           which will be subsequently apparent, reside in the  
5           details of construction and operation as more fully  
6           hereinafter described and claimed, with reference being  
7           had to the accompanying drawings forming a part hereof,  
8           wherein like numerals refer to like elements  
9           throughout.

10           **BRIEF DESCRIPTION OF THE DRAWINGS**

11           Fig. 1 is a detailed block diagram of the  
12           structure of the intellectual property audit system of  
13           the present invention;

14           Fig. 2 is a conceptual diagram of the intellectual  
15           property audit system of the present invention;

16           Figs. 3-6 are block diagrams illustrating  
17           additional embodiments of the pattern matching system;

18           Fig. 7 is an illustration of a main central  
19           processing unit for implementing the computer  
20           processing;

21           Fig. 8 is a block diagram of the internal hardware  
22           of the computer illustrated in Fig. 7; and

23           Fig. 9 is an illustration of an exemplary memory  
24           medium which can be used with disk drives illustrated  
25           in Fig. 7 or Fig. 8.

26           **NOTATIONS AND NOMENCLATURE**

27           The detailed descriptions which follow may be  
28           presented in terms of program procedures executed on a  
29           computer or network of computers. These procedural

1 descriptions and representations are the means used by  
2 those skilled in the art to most effectively convey the  
3 substance of their work to others skilled in the art.

4 A procedure is here, and generally, conceived to  
5 be a self-consistent sequence of steps leading to a  
6 desired result. These steps are those requiring  
7 physical manipulations of physical quantities.

8 Usually, though not necessarily, these quantities take  
9 the form of electrical or magnetic signals capable of  
10 being stored, transferred, combined, compared and  
11 otherwise manipulated. It proves convenient at times,  
12 principally for reasons of common usage, to refer to  
13 these signals as bits, values, elements, symbols,  
14 characters, terms, numbers, or the like. It should be  
15 noted, however, that all of these and similar terms are  
16 to be associated with the appropriate physical  
17 quantities and are merely convenient labels applied to  
18 these quantities.

19 Further, the manipulations performed are often  
20 referred to in terms, such as adding or comparing,  
21 which are commonly associated with mental operations  
22 performed by a human operator. No such capability of a  
23 human operator is necessary, or desirable in most  
24 cases, in any of the operations described herein which  
25 form part of the present invention; the operations are  
26 machine operations. Useful machines for performing the  
27 operation of the present invention include general  
28 purpose digital computers or similar devices.

29 The present invention also relates to apparatus  
30 for performing these operations. This apparatus may be  
31 specially constructed for the required purpose or it

1 may comprise a general purpose computer as selectively  
2 activated or reconfigured by a computer program stored  
3 in the computer. The procedures presented herein are  
4 not inherently related to a particular computer or  
5 other apparatus. Various general purpose machines may  
6 be used with programs written in accordance with the  
7 teachings herein, or it may prove more convenient to  
8 construct more specialized apparatus to perform the  
9 required method steps. The required structure for a  
10 variety of these machines will appear from the  
11 description given.

12 DESCRIPTION OF THE PREFERRED EMBODIMENT

13 The intellectual property audit system according  
14 to the present invention may be used as an integrity  
15 check for acquisitions having assets involving a  
16 substantial intellectual property portfolio. The  
17 system could be used to compare the intellectual  
18 property portfolio to be acquired with other  
19 intellectual property portfolios having known market  
20 values to obtain an indicator of the intellectual  
21 property portfolio's worth. Depending on the quality  
22 of empirical data, the intellectual property audit  
23 system of the present invention could provide a  
24 qualitative and/or quantitative analysis of an  
25 intellectual property portfolio which is to be  
26 acquired.

27 Fig. 2 is a conceptual diagram of the intellectual  
28 property audit system of the present invention. The  
29 intellectual property audit system would operate in  
30 general terms as follows. In Fig. 2, the user of the

1 audit system would input the appropriate data to an  
2 input device 14. In the most basic form, the input  
3 data might simply be a list of patent numbers for an  
4 intellectual property portfolio comprising only  
5 patents.

6 Next, the data would be transmitted to a database  
7 access device 16 which would collect various data from  
8 different on-line intellectual property databases 18.

9  
10 The collected data represents different intellectual  
11 property worth indicators. Each worth indicator would  
12 then be assigned a value which would be approximated  
13 using previously collected indicator values which are  
14 based on intellectual property portfolios which have  
15 known worth or dollar values by consulting empirical  
16 database 22. For example, the audit system could  
17 access a full text patent database such as DIALOG to  
18 analyze the listed patents. Specifically, the system  
19 could determine how many claims, dependent and  
20 independent, are in each patent. A high value would be  
21 assigned to this indicator if there are many claims,  
22 indicating that the drafter or owner of the patent  
23 considered the patent of significant importance.

24 Additionally, the number of references cited or number  
25 of classes searched could also be gathered and a high  
26 value assigned to the indicator when the patent lists  
27 many classes or many cited references. The rationale  
28 for the high value would be that there is reason to  
29 believe that the examiner performed a detailed  
30 examination leaving the issued patent strong. Further,  
31 each patent could also be searched to determine how  
often the patent itself has been cited as a reference

1 on other patents. Higher values would be assigned to a  
2 patent cited more often than not, indicating that the  
3 patent was perhaps a breakthrough in a particular  
4 field.

5 Similar information could also be collected for  
6 trademarks which are included in the intellectual  
7 property portfolio from such databases as DIALOG's  
8 FEDERAL TRADEMARK SCAN and STATE TRADEMARK SCAN which  
9 inventory federal and state trademarks, respectively.  
0 Based upon these databases, a user might, for example,  
0 determine whether a trademark includes disclaimers to  
0 certain words in the trademark and/or how many classes  
0 the trademark has been issued for or covers. In  
0 addition, ORBIT's LEGAL STATUS database includes recent  
0 information affecting the trademark, and LEXIS' NEXIS  
0 database could be used to determine any recent  
0 information relating to the trademark which has been  
0 published in trade magazines or newspapers.  
1

2 Finally, intellectual property which also includes  
3 copyrighted work could also be considered in a similar  
4 manner. For example, computer software related  
5 intellectual property might include both patents on the  
6 computer system as well as copyrights on the software  
7 itself.

8 Once all the worth indicators have been  
9 determined, they are transmitted to an indicator  
0 comparing device 20 which would compare the collection  
0 of worth indicators to known collections of worth  
0 indicators from known intellectual property portfolios  
0 stored in empirical database 22. Known distribution or  
0 estimation techniques could be used to determine which

1 known intellectual property portfolio the intellectual  
2 property portfolio which is to be acquired matches the  
3 closest. Finally, the system would output the known  
4 portfolio worth value 24 for which the portfolio to be  
5 acquired matches the most, signifying a rough  
6 approximation of the worth of the portfolio to be  
7 acquired. A detailed description of the intellectual  
8 property audit system according to the present  
9 invention follows.

0 10 Fig. 1 represents a block diagram representation  
0 11 of the proposed intellectual property audit system. In  
0 12 Fig. 1, data input device 2 is used to input the  
0 13 necessary data representing the intellectual property  
0 14 portfolio to be acquired. This data may be, for  
0 15 example, simply the list of patent numbers in the  
0 16 portfolio, or the data might include additional  
0 17 information relating to the specific intellectual  
0 18 property portfolio or the selling/acquiring entities  
0 19 which might not be readily retrievable from current  
20 databases. For example, the additional information  
21 might include financial information regarding the  
22 selling/acquiring entities or recent performance in the  
23 stock market. Data input device 2 is a standard input  
24 device and may include, for example, the data entry  
25 system in U.S. Patent 4,012,720 or the data entry interface assembly in U.S. Patent 4,638,422, — incorporated herein by reference. In any event, the  
26 data is entered and then transmitted to database access  
27 and collection device 4.  
28  
29

30 Database access and collection device 4 filters  
31 the received data to determine which aspects of the

1 received data are to be further analyzed by retrieving  
2 information regarding the data from various on-line  
3 databases. For example, database access and collection  
4 device 4 would determine that the received patent  
5 numbers should be used to analyze the patents while the  
6 received financial data might not be further analyzed  
7 and simply transmitted to data processor 6 for later  
8 evaluation.

9 With respect to the data which is to be analyzed,  
10 database access and collection device 4 will access the  
11 various databases having information concerning the  
12 data to be analyzed and collect the necessary  
13 information regarding the data. For example, with  
14 respect to the patent number information, database  
15 access and collection device 4 would access the ORBIT  
16 database to determine if the patent is currently  
17 involved in a pending litigation using such databases  
18 as the LITALERT Database, or whether the patent is  
19 under reexam or reissue using such ORBIT databases as  
20 LEGAL STATUS or PATENT STATUS. Database access and  
21 collection device 4 could also access the LEXIS/NEXIS  
22 database to determine whether any newspapers have  
23 published any current information regarding the patents  
24 as well as determining whether the patent has been  
25 involved in previous lawsuits by accessing the legal  
26 reporter files.

27 Finally, database access and collection device 4  
28 can also access a full-text patent database such as  
29 DIALOG to either collect the necessary information  
30 directly from DIALOG or to obtain the patents  
31 themselves. The types of patent information which

would provide important information could be of two forms. The first type of information would be patent information derived directly from the patents. Such information would include number of claims, the length of the independent claims, number of references cited, number of classes searched, whether the patent is a reissue or reexam, number of years until patent expires or in which group the patent was examined. In addition, the indicators may include whether the inventor(s) is a U.S. or foreign citizen, or whether the current owner is U.S. or foreign based. Further, information regarding U.S. or foreign priority, and whether the cited references have publication dates near the priority dates could also be considered.

The second type of information would not be derived from the patent itself, but would be information derived from other patents. For example, this information might be how often the patent being acquired has been cited as a reference for other patents.

Similar information could also be collected for trademarks which are included in the intellectual property portfolio from such databases as DIALOG's FEDERAL TRADEMARK SCAN and STATE TRADEMARK SCAN which inventory federal and state trademarks, respectively. Based upon these databases, a user might, for example, determine whether a trademark includes disclaimers to certain words in the trademark and/or how many classes the trademark has been issued for or covers. In addition, ORBIT's LEGAL STATUS database includes recent information affecting the trademark, and LEXIS' NEXIS

1 database could be used to determine any recent  
2 information relating to the trademark which has been  
3 published in trade magazines or newspapers.

4 Finally, intellectual property which also includes  
5 copyrighted work could also be considered in a similar  
6 manner. For example, computer software related  
7 intellectual property might include both patents on the  
8 computer system as well as copyrights on the software  
9 itself.

0 10 Database access and collection device 4 may be any  
0 11 standard device which may interface with the various  
0 12 other databases using, for example, software which is  
0 13 able to mimic or compatible with the software systems  
0 14 of the various databases. Accordingly, database access  
0 15 and collection device 4 may include, for example, the  
0 16 data collection system in U.S. Patent 3,810,101 or the  
0 17 information retrieval system in U.S. Patent 4,064,490,  
0 18 incorporated herein by reference. Additionally,  
0 19 database access and collection device 4 may also  
20 include, for example, the machine translation system in  
21 U.S. Patent 4,814,988 or the computer method for  
22 automatic extraction of commonly specified information  
23 from business correspondence in U.S. Patent 4,965,763,  
24 incorporated herein by reference.

25 The collected information, including, for example,  
26 the first and second types of patent information  
27 discussed above, are then transmitted to data processor  
28 6 to process the collected data. The data which does  
29 not require processing in data processor 6 may be  
30 simply passed to indicator weighing device 8. Data  
31 processor 6 would then process the collected data as

1 follows: For each of the above indicators, data  
2 processor 6 would assign an importance factor, based  
3 upon predetermined data stored in empirical database  
4 12, for each of the indicators indicating the  
5 importance of the collected data with respect to each  
6 indicator. Data processor 6 may include any standard  
7 data processor such as the 386 data processor  
8 manufactured by various companies including Intel and  
9 may include the various functions of the artificial  
10 intelligence system in 4,670,848, incorporated herein  
11 by reference.

12 Empirical database 12 may be a single database  
13 storing all the required empirical data, or empirical  
14 database 12 may be comprised of several smaller  
15 databases each storing different required data used by  
16 the intellectual property audit system of the present  
17 invention. Empirical database may be any standard  
18 database and may include, for example, the data storage  
19 and processing apparatus in U.S. Patent 3,911,403, <sup>19</sup> incorporated  
20 herein by reference.

21 For example, if data access and collection device  
22 4 searched the DIALOG database and collects information  
23 that a specific patent has been cited over 100 times,  
24 i.e., a citation indicator, data processor 6 might  
25 assign an importance factor of 10 on a scale of 1 to 10  
26 to the citation indicator. Similarly, if database  
27 access and collection device 4 determines that the  
28 patent was searched in only one class for the class  
29 indicator, data processor 6 might assign a 1 on a scale  
30 of 1 to 10 to the class indicator. Note that  
31 currently, both the class and citation indicators have

1           the same relative importance. As discussed above, data  
2 processor 6 determines the 10 value for the citation  
3 indicator and the 1 value for the class factor by  
4 comparing the indicators to predetermined indicators  
5 having predetermined values. These predetermined  
6 indicators are based upon collected known indicators  
7 from known intellectual property portfolios.

8           The determined worth indicators are then  
9 transmitted to an indicator weighing device 8 which  
10 prioritizes each of the indicators against each other  
11 based upon predetermined weighing schemes which have  
12 been determined from known portfolios by also  
13 consulting empirical database 12. For example, the  
14 citation indicator may be more important, for example  
15 twice as important, than the class indicator based upon  
16 predetermined experience.

17          The weighted indicators are transmitted to  
18 indicator comparing device 10 which compares the  
19 collection of worth indicators to known collections of  
20 worth indicators from known intellectual property  
21 portfolios by consulting database 12 storing the  
22 empirical data. Known distribution or estimation  
23 techniques could be used to determine the closest  
24 matching known intellectual property portfolio to the  
25 intellectual property portfolio which is to be  
26 acquired. Finally, the system would output the known  
27 value for which the portfolio to be acquired matches  
28 the most signifying a rough approximation of the worth  
29 of the portfolio to be acquired. The output may be  
30 displayed on any display, such as the display systems  
31 for electronic data processing equipment in U.S. Patent

1           3,820,080, incorporated herein by reference.

2           In addition to the above features, the present  
3           invention also includes the feature of manual  
4           assistance processing in the event the process of the  
5           present invention fails for known or unknown reasons.  
6           Accordingly, when a failure occurs, a notice is  
7           generated to a predetermined location where manual  
8           assistance may be performed. Each of data input device  
9           2, database access and collection device 4, data  
10          processor 6, indicator weighing device 8, indicator  
11          comparing device 10 are programmed to output manual  
12          assistance requests to different locations or the same  
13          location depending on whether the manual work force  
14          must be spread over more than one location. Thus, the  
15          present invention is also able to effectively correct  
16          failures in the processing of the intellectual property  
17          portfolio in order that the process continue to  
18          determine an intellectual property portfolio worth  
19          indicator. Thus, manual assistance may be performed  
20          for different aspects of the processing, and the  
21          processing may be restarted in a standard manner for  
22          the determination of the intellectual property worth  
23          indicator.

24          Advantageously, the present invention also  
25          utilizes comparison techniques using neural network  
26          pattern matching processes. The specific types of  
27          pattern matching techniques implemented by the  
28          comparison system/device which have already been tested  
29          and shown to provide excellent results are the standard  
30          Kohonan and the Back Propagation neural networks, see,  
31          for example, U.S.Patents 5,146,541 and 5,303,330,

1 incorporated herein by reference. However, other  
2 pattern matching techniques could also be used,  
3 depending on the required application. In each type of  
4 comparison, a neural network is selected that is  
5 suitable to the requirements of the application. The  
6 Kohonan and Back Propagation networks are discussed  
7 below.

8 The Kohonan neural network is useful in grouping  
9 similar patterns. The primary benefit of the Kohonan  
10 neural net as the basis for finding duplicate  
11 information is that it does not require training. The  
12 neural network is built and the categories are created  
13 as the entries are provided to the Kohonan neural net.  
14 When a Kohonan neural network was used with the Neural  
15 Pattern described earlier in connection with Fig. 18,  
16 effective results are provided for small population  
17 sizes.

18 In a Kohonan neural network each entry is fed into  
19 the network and a value is returned. By keeping track  
20 of the output numbers, entries with similar output  
21 numbers are grouped as similar. One disadvantage of  
22 the Kohonan neural network is that it may be moderately  
23 slow and is somewhat ineffective using large  
24 populations of entries. That is, as the number of  
25 entries in the system increases, its ability to  
26 effectively group similar data decreases.

27 The Back Propagation neural network is a trainable  
28 network. Using this method the entries are fed into  
29 the network in a first pass, which creates the neural  
30 pattern. Then a second pass is made with each entry to  
31 determine which values are to be compared. The second

1 pass thereby indicates to what extent the current entry  
2 matches any of the entries in the population. There is  
3 a guarantee that the entry will at least match on  
4 itself within the population.

5 The Back Propagation network is created by  
6 creating an input/output array with as many slots as  
7 there are entries. For example, if there are 2000  
8 entries in the population, then a 2000 slot  
9 input/output array is created. For each entry that is  
10 entered into the Back Propagation network, a second  
11 array is provided indicating which entry in the  
12 sequence it is. The first entry in the input/output  
13 array is indicated by setting the first slot to 1 and  
14 the remaining slots to 0. The second entry is  
15 indicated by setting the second slot to 1 and the  
16 remaining slots to 0, and so on.

17 When the entire Back Propagation network is  
18 trained with the entries, a second pass is made to  
19 evaluate each entry against the population. In the  
20 evaluation phase, each entry is passed through the  
21 network along with an empty input/output array. The  
22 Back Propagation network fills in the array with a  
23 value between 0 and 1 for each slot. A value of 1  
24 indicates an exact match and a value of 0 indicates no  
25 match whatsoever. By scanning the input/output array  
26 for each entry in this manner, a table can be built of  
27 each entries comparative value with all the entries in  
28 the population. Any threshold can be set to consider a  
29 match relevant as potential duplicate or fraudulent  
30 data. For example, a .5 can be considered a relevant  
31 match. In this case if an entry matches any other with

1 a value of .5 or greater, it is considered a potential  
2 duplicate.

3 The advantages of the Back Propagation network are  
4 that it provides a relative ranking of entries and  
5 their matches with other entries in a population, and  
6 that it can easily be extended to other types of  
7 comparison-related applications. As compared with the  
8 Kohonan, this neural net method provides a value that  
9 indicates the extent one entry matches another. This  
10 can be used to provide different thresholds for  
11 indicating a match. This method can also be used for a  
12 wide variety of comparison-related problems. In cases  
13 where a match on similar values is required without  
14 necessarily grouping items, this method can be used as  
15 opposed to the Kohonan. For example, in many companies  
16 there is a need to find employees that are acting as  
17 vendors to the company, since this is likely a conflict  
18 and may potentially be the basis of fraud. However,  
19 the name, address, social security number or other  
20 information of how the employee is registered as a  
21 vendor will likely be varied from the way the employee  
22 is registered as an employee (e.g., in the human  
23 resource system). To find such conflicts a Back  
24 Propagation network can be built using the entries of  
25 the human resource system, i.e., the employee database.  
26 Then, each entry of the vendor database can be used to  
27 find whether there is a relative match in the employee  
28 database. Since the entries are translated into one of  
29 the neural-based patterns, the Binomial neural network  
30 will identify similar entries and match on employees  
31 that have slightly altered their identification as

1 vendors in the vendor system.

2 Kohonan and Back Propagation Neural Networks are  
3 standard and may be implemented by, for example,  
4 NEUROWINDOWS: Neural Network Dynamic Link Library,  
5 manufactured by Ward Systems Group, Inc., the manual of  
6 which is incorporated herein by reference. Similar  
7 networks are also disclosed, for example, in Caüdill,  
8 M., The Kohonan Model, Neural Network Primer, AI  
9 Expert, 1990, 25-31; Simpson, P., Artificial Neural  
10 Systems, New York, NY, Pergamon Press, 1990; Wasserman,  
11 P., Neural Computing Theory and Practice, New York, NY,  
12 Van Nostrand Reinhold, 1989; Specht D. and Shapiro, P.,  
13 Generalization Accuracy of Probabilistic Neural Networks  
14 Compared With Back-Propagation Networks, Proceedings of  
15 the International Joint Conference on Neural Networks,  
16 July 8-12, 1991, 1, 887-892, all of which are  
17 incorporated herein by reference.

18 Figs. 3-6 are block diagrams illustrating  
19 additional embodiments of the pattern matching system.  
20 In these embodiments, the hardware configuration is  
21 arranged according to the multiple instruction multiple  
22 data (MIMD) multiprocessor format for additional  
23 computing efficiency. Fig. 3 uses a more distributed  
24 database approach, whereas Fig. 4 uses a central  
25 database. Fig. 5 uses a similar approach across a  
26 public switched telephone network, and Fig. 6 uses a  
27 distributed approach where the different systems are  
28 cross coupled in a standard fashion. The details of  
29 this form of computer architecture are disclosed in  
30 greater detail in, for example, U.S. Patent No.

1                 5,163,131, Boxer, A., Where Buses Cannot Go, IEEE  
2                 Spectrum, February 1995, pp. 41-45; and Barroso, L.A.  
3                 et al., RPM: A Rapid Prototyping Engine for  
4                 Multiprocessor Systems, IEEE Computer February 1995,  
5                 pp. 26-34, all of which are incorporated herein by  
6                 reference.

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7                 Fig. 7 is an illustration of ~~main central~~  
8                 processing unit 218 for implementing the computer  
9                 processing in accordance with one embodiment of the  
10                 present invention. In Fig. 7, computer system 218  
11                 includes central processing unit 234 having disk drives  
12                 236 and 238. Disk drive indications 236 and 238 are  
13                 merely symbolic of the number of disk drives which  
14                 might be accommodated in this computer system.  
15                 Typically, these would include a floppy disk drive such  
16                 as 236, a hard disk drive (not shown either internally  
17                 or externally) and a CD ROM indicated by slot 238. The  
18                 number and type of drives varies, typically with  
19                 different computer configurations. The computer  
20                 includes display 240 upon which information is  
21                 displayed. A keyboard 242 and a mouse 244 are  
22                 typically also available as input devices via a  
23                 standard interface.

24                 Fig. 8 is a block diagram of the internal hardware  
25                 of the computer 218 illustrated in Fig. 7. As  
26                 illustrated in Fig. 8, data bus 248 serves as the main  
27                 information highway interconnecting the other  
28                 components of the computer system. Central processing  
29                 units (CPU) 250 is the central processing unit of the  
30                 system performing calculations and logic operations  
31                 required to execute a program. Read-only memory 252

1 and random access memory 254 constitute the main memory  
2 of the computer, and may be used to store the  
3 simulation data.

4 Disk controller 256 interfaces one or more disk  
5 drives to the system bus 248. These disk drives may be  
6 floppy disk drives such as 262, internal or external  
7 hard drives such as 260, or CD ROM or DVD (digital  
8 video disks) drives such as 258. A display interface  
9 264 interfaces with display 240 and permits information  
10 from the bus 248 to be displayed on the display 240.  
11 Communications with the external devices can occur on  
12 communications port 266.

13 Fig. 9 is an illustration of an exemplary memory  
14 medium which can be used with disk drives such as 262  
15 in Fig. 8 or 236 in Fig. 7. Typically, memory media  
16 such as a floppy disk, or a CD ROM, or a digital video  
17 disk will contain, inter alia, the program information  
18 for controlling the computer to enable the computer to  
19 perform the testing and development functions in  
20 accordance with the computer system described herein.

21 Finally, it should be noted that the various steps  
22 of the present invention are performed in hardware.  
23 Accordingly, each step of the present invention  
24 typically generates an electrical signal which  
25 represents a result of a specific step performed by  
26 each of the above elements in Figs. 1 and 2.  
27 Accordingly, the above discussion represents the  
28 electrical signals which are generated and used in the  
29 various procedures of the present invention.

30 The many features and advantages of the invention  
31 are apparent from the detailed specification, and thus,

1 it is intended by the appended claims to cover all such  
2 features and advantages of the invention which fall  
3 within the true spirit and scope of the invention.  
4 Further, since numerous modifications and variations  
5 will readily occur to those skilled in the art, it is  
6 not desired to limit the invention to the exact  
7 construction and operation illustrated and described,  
8 and accordingly, all suitable modifications and  
9 equivalents may be resorted to, falling within the  
10 scope of the invention.

11 **What is claimed is:**